



## Genetic engineering: An advance step in agriculture growth

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**Biotechnology:** It is the application of scientific techniques to modify and improve plants, animals and micro-organisms to enhance their value.

**Agricultural biotechnology:** It is the area of biotechnology involving applications to agriculture. Agricultural biotechnology has been practiced for a long time, as people have sought to improve agriculturally important organisms by selection and breeding.

In the 1970s, advances in the field of molecular biology provided scientists with the ability to manipulate DNA—the chemical building blocks that specify the characteristics of living organisms— at the molecular level.

This technology is called genetic engineering. It also allows transfer of DNA between more distantly related organisms than was possible with traditional

breeding techniques. Today, this technology has reached a stage where scientists can take one or more specific genes from nearly any organism, including plants, animals, bacteria, or viruses, and introduce those genes into another organism. An organism that has been transformed using genetic engineering techniques is referred to as a transgenic organism, or a genetically engineered organism.

**Benefits of genetic engineering in agriculture:** Everything in life has its benefits and risks and genetic engineering is no exception. Much has been said about potential risks of genetic engineering technology, but so far there is little evidence from scientific studies that these risks are real. Transgenic organisms can offer a range of benefits above and beyond those that emerged from innovations in traditional agricultural biotechnology. Following are a few examples of benefits resulting from

applying currently available genetic engineering techniques to agricultural biotechnology.

**Increased crop productivity:** Biotechnology has helped to increase crop productivity by introducing such qualities as disease resistance and increased drought tolerance to the crops.

**Enhanced crop protection:** Farmers use crop-protection technologies because they provide cost-effective solutions

to pest problems which, if left uncontrolled, would severely lower yields. As mentioned above, crops such as corn, cotton and potato have been successfully transformed through genetic engineering to make a protein that kills certain insects when they feed on the plants.

**Improvements in food processing:** The first food product resulting from genetic engineering technology to receive

regulatory approval, in 1990, was chymosin, an enzyme produced by genetically engineered bacteria.

**Improved nutritional value:** Genetic engineering has allowed new options for improving the nutritional value, flavour and texture of foods.

**Fresher produce:** Genetic engineering can result in improved keeping properties to make transport of fresh produce easier, giving consumers access to nutritionally valuable whole foods and preventing decay, damage, and loss of nutrients. Transgenic tomatoes with delayed softening can be vine-ripened and still be shipped without bruising.

**Environmental benefits:** When genetic engineering results in reduced pesticide dependence, we have less pesticide residues on foods, we reduce pesticide leaching into groundwater and we minimize farm worker exposure



to hazardous products.

Benefits for developing countries genetic engineering technologies can help to improve health conditions in less developed countries.

Researchers from the Swiss Federal Institute of Technology's Institute for Plant Sciences inserted genes from a daffodil and a bacterium into rice plants to produce "golden rice," which has sufficient beta-carotene to meet total vitamin-A requirements in developing countries with rice-based diets. This crop has potential to significantly improve vitamin uptake in poverty-stricken areas where vitamin supplements are costly and difficult to distribute and vitamin A deficiency leads to blindness in children.

**Benefits of genetic engineering to society:**

Responsible scientists, farmers, food manufacturers, and policy makers recognize that the use of transgenic

organisms should be considered very carefully to ensure that they pose no environmental and health risks, or at least no more than the use of current crops and practices.



Modern biotechnology represents unique applications of science that can be used for the betterment of society through development of crops with improved nutritional quality, resistance to pests and diseases, and reduced cost of production. Biotechnology, in the form of genetic engineering, is a facet of science that has the potential to provide important benefits if used carefully and ethically. Society should be provided with

a balanced view of the fundamentals of biotechnology and genetic engineering, the processes used in developing transgenic organisms, the types of genetic material used, and the benefits and risks of the new technology.

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